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THE PLANT DISEASE REPORTER

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THE PLANT DISEASE SURVEY, DIVISION OF MYCOLOGY AND DISEASE SURVEY
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The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations and comments submitted voluntarily by qualified observers. These reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

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STANDARDIZATION OF PLANT DISEASE SURVEYS[1]

C. M. Haenseler

I believe we all agree that accurate data on Disease Prevalence and Losses are highly valuable and that every effort should be made to obtain such data on as many crops as possible. There may be a few who would raise slight objections to this generalization, but I believe that even these would withdraw their objections if we place sufficient emphasis on the words "accurate data". This may be the extent of complete agreement, however. Beyond this starting point marked differences in opinion will certainly begin to appear.

There will be a debate on how we should proceed to gather these data. There will be arguments as to how accurate the data must be in order for them to be of value. There will probably be controversies on the merits of a large volume of crude estimates as compared with a smaller amount of more accurate data. Questions may also be raised as to the primary purpose for which the data are assembled and what use should be made of them. These and many other equally pertinent questions must constantly be considered in planning disease surveys.

The survey methods adopted must be kept in line with these differences in opinion and must depend, to a large extent, on the emphasis placed on the various points of view held by different workers. Certainly there can be no single standardized system of collecting plant disease data which will meet all needs. The survey problems are too complex to permit such simplification. For example, recent surveys on the Strawberry Red Stele, the "X" disease of peach, and the twig canker disease of peach in New Jersey were conducted to determine the presence or absence of the disease in as many locations as possible. A definite objective was in mind and the method of survey was adapted to this specific objective. In this case it would have been far less valuable to spend the allotted time on very accurate measurements of disease incidence in a few fields. More could be gained by observing presence or absence of the disease over a much larger area. The surveys served their purpose without the use of accurate counts. In other cases, recording the mere presence or absence of a disease has little value and the relative severity of the disease becomes the all important factor. Between these extremes, there are no doubt a continuous series of worthy disease survey objectives, each demanding its own specific method of approach.

This admission of the complexity of disease survey problems does not necessarily mean that some type of standardization of methods is impossible. On the contrary, I think it emphasizes the importance of establishing standards at every point possible. Such standards adopted one after another as they are worked out would gradually but surely bring some degree of order to a chaotic field.

I should like to mention a few points where I think greater uniformity in survey methods might be of help.

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[1] Paper read at Roundtable Conference sponsored by "Plant Disease Survey Sub-Committee Dec. 4, 1943 in Columbus, Ohio meeting of The American Phytopathological Society.

In the first place, surveys should be made with a very specific objective in mind. Some may claim that this is already done, but I doubt if this is always true. It seems that many surveys are made to see if something might be accidentally found which might prove to be useful. Random surveys which give isolated notations on prevalence of a large number of diseases which happened to be observed by a surveyor at a particular place and on a particular date, have very little value. Even after repeated, uncorrelated observations of this kind there is seldom sufficient data accumulated on any specific subject to do any more than raise doubts as to the meaning of the reports. We have many times tried to use such random reports which had been accumulated over a period of years and usually they were thrown aside as useless, or were used only because they seemed to fit into an hypothesis for which we already had strong support. I should strongly oppose this "shot gun" method of plant disease survey where the surveyor is directed merely to "look around and see what you can see." Such random surveys with no specific objective may not be wholly worthless but they are rarely so productive of useful data as surveys made with a specific purpose in mind. Specific surveys usually yield results that can be properly interpreted and used immediately whereas the data from random, all-inclusive surveys are generally filed away for future reference. When they are finally dusted off and analyzed, they are usually found so wanting in both quantity and relationship that they are refiled for "future reference" again. I think one of our first tasks in plant disease survey work is to give serious thought to the objective of the surveys, and then proceed towards that specific goal.

I believe also that the ultimate value of our plant disease survey work could be greatly increased if coordinated action were adopted within natural crop areas so that surveys involving a specific disease problem would be conducted throughout a related zone at the same time. This may call for cooperative action between several independent government and state agencies, but such cooperative action has met with success in numerous research and other fields, and may not be beyond possibility in disease surveys. New Jersey might undertake an extensive survey of prevalence and losses due to potato diseases one year and tomato diseases the next. An adjacent state might also decide to make such studies but reverse the timing. The two year's work would be of far greater value if the survey in the different states were directly comparable. With the more extended area involved in the same survey, information on seasonal relations, regional effects and other items might be brought out which would be lost in a more limited survey. It may take a long time to work out such coordinated, cooperative surveys, but I believe they should be encouraged whenever a disease survey problem arises which would lend itself to such cooperative effort.

I should like to mention one other point which may have considerable bearing on what methods should be used in estimating disease prevalence and losses. This relates to the question of crop losses. If disease surveys are made for the prime purpose of determining the crop losses as expressed in money loss, the viewpoint of the surveyor will have to be focused differently than if the survey is made to determine disease prevalence. In some cases, accurate plant disease readings can be immediately

transposed to crop loss but even then not to money loss. Conversion to money losses is so tied up with unknowns, and variable factors, that even the best money loss figures are so theoretical that it might be simpler to avoid them entirely. I think it should be our duty as Plant Pathologists to conduct our plant disease surveys solely on a fact-finding basis, limiting the reports to regional distribution, disease incidence, and relative effect of disease on yield or quality.

Mr. Harry B. Weiss, writing in the Journal of the New York Entomological Society[2] some years ago, points out some of the serious errors that are made in attempting to report crop damages due to insects in terms of dollars. He states that "Where these losses are converted into dollars they total to a staggering sum which includes the enhanced value given to the destroyed portions of the crop," and he concludes that there is no reliable method of reporting losses in terms of dollars. It may be possible that reports of these "staggering sums" of money losses referred to by Mr. Weiss encourage financial support of survey projects, but it should not be necessary to resort to such exaggeration to gain this support. The primary objective of plant disease surveys should not be directed towards establishing how much money was lost due to the disease, but rather to assemble and correlate accurate information which may aid in reducing these losses. The points of view in these two objectives are quite different and the approach towards a survey project will be influenced by the point of view taken.

Plant disease surveys could be at least partially standardized and simplified by limiting them as suggested above, that is: (1) by carefully choosing a survey method adapted to the specific problem in hand; (2) by avoiding objectiveless, all-inclusive, disease surveys which rarely yield sufficient data on any particular subject to be of value; (3) by conducting the survey for a specific purpose and keeping this purpose constantly in mind; (4) by surveying a sufficiently large area to make correlations and interpretations of the data possible; (5) by conducting the survey to determine incidence of the disease and effects of the disease on crop yield or quality rather than to determine financial losses.

After these limitations, there still remain the perplexing problems of standardization of methods of taking and recording data, so that they may be comparable when taken at different times and by different individuals. This standardization itself is no small task and will have to be worked out slowly, point by point. A paper by Dr. W. C. Moore on "The Measurement of Plant Diseases in the Field" published recently,[3] gives us some idea of the problems involved in standardizing disease survey methods. Dr. Moore, through the cooperation of a committee of plant pathologists, has been testing the workability of a standardized method of disease reading used by a number of observers. Such cooperative work in testing a tentative method which is gradually modified as faults are detected by the cooperators and which is ultimately adopted as the standard method of

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[2] Vol. XLVIII, June 1940, pages 195-199.

[3] "The Brit. Myc. Soc. Trans." Vol. 26: Pts. 1 & 2. April, 1943.

taking records on a specific disease, is certain to solve some of the ills in disease survey work. The chemists have their "standard methods" so that the results obtained by different analysts can be compared. If we should develop and adopt standard methods for plant disease estimates, our survey data would also be more easily interpreted and correlated.

Many of our plant pathologists have already worked out very acceptable methods for determining the prevalence of specific diseases in which they have been most interested, but little has been done to get any particular method recognized as a standard. With very little effort a number of these methods might be tested under a wide range of conditions by cooperators, as was done in England, and adopted, probably with little change, as the official method. Further refinement of such a standard might be desirable when used for specific problems but the standard would still be acceptable for the majority of cases. There may, likewise, be many survey problems where such standard methods would be too complex for the job in hand, but this also should not reflect on their value. Under our present system, incidence of a disease may be reported by either a very simple or a complex method with nothing in the report to indicate how the data were obtained. A statement indicating that "counts were made by the official method" would stamp the data with a greater degree of authority. The working out and adoption of such standard methods will take time and patience and a good spirit of cooperation, but it is sure to more than pay for the effort by increasing the value of the survey data obtained.
NEW JERSEY AGRICULTURAL EXPERIMENT STATION

LATE BLIGHT ON POTATO AND TOMATO IN SOUTHERN AND WESTERN AREAS

UNUSUAL OCCURRENCE OF LATE BLIGHT ON THE FALL CROP OF POTATOES IN THE BELLE GLADE, FLORIDA AREA: An estimated loss of 25 to 33% from late blight (Phytophthora infestans) occurred in the Belle Glade fall-crop potatoes this season. The crop consisted of about 3000 acres of Bliss Triumphs. Late blight previously has occurred only on the spring crop in March and April. This season it was found on unsprayed fall crop potatoes on November 23 following a rainy period of 6 days, from November 17 to 22 inclusive, during which 1.75 inches of rain fell. About a week later it was appearing on sprayed potatoes. It was well controlled in several fields that were thoroughly sprayed but in general spraying delayed the onset of the disease about one week. -- R. A. Hyre, Emergency Plant Disease Prevention Project, and G. R. Townsend, Everglades Experiment Station, Belle Glade, Florida

LATE BLIGHT ON POTATOES AND TOMATOES AND OTHER DISEASES ON POTATOES IN THE LOWER RIO GRANDE VALLEY OF TEXAS: Late blight was observed first in the Lower Rio Grande Valley on December 27, by Dr. G. H. Godfrey in the experimental potato plots at the Experiment Station, Weslaco. A survey was immediately undertaken to determine the distribution of the disease. Late blight was found abundantly in every field visited between San Juan and Brownsville. While December frosts killed some vines, in some fields late blight appears to be responsible for much of the dead foliage. Infections

were found on leaflets, petioles, stems, and tubers, often with luxuriant conidiophore production.

On January 5, 1944, late blight was found on tomatoes attacking leaves, stems, and fruits. A survey showed this disease in small amounts in all but one of 13 commercial fields visited. Most of the tomato vines had been killed by earlier frosts but the fruit in some fields was heavily affected. This is the first time in several years that blight has appeared on tomatoes in this Valley.

The significance of this outbreak is the threat to the spring potato and tomato crops now being planted, since fall-planted crops often overlap the spring crops. Although the fall acreage is relatively small, the presence of abundant inoculum on both potatoes and tomatoes constitutes a real danger. Growers are being advised of this condition in order that preventive measures may be undertaken. On the basis of this information, a leading fungicide and insecticide dealer has ordered material for a substantially greater amount of fungicides for the spring crop.

December weather was generally favorable for late blight: precipitation .43 inches above normal, with 20 days being recorded as either showers or fog; relative humidity was high, average 89.3%; mean temperature was 60.4° F. with frosts on December 16 (31°), December 18 (31°), and December 19 (32°).

Early blight (Alternaria solani) was present in small amounts in most potato fields. Scab (Actinomyces scabies) was fairly abundant in the few cases where tubers were examined. Virus diseases were abundant in one late planted field where local seed from the spring crop was used. In the potatoes being dug at the Experiment Station, scab wes prevalent and rootknot nematode (Heterodera marioni) infestations were abundant; a trace of Rhizoctonia solani was also found. -- Stuart M. Pady, Emergency Plant Disease Prevention Project.

LATE BLIGHT FRUIT ROT OF TOMATOES IN SOUTHERN CALIFORNIA: Late blight fruit rot was found in tomato fields near Vista, San Diego County. -- Seth Barton Locke, Emergency Plant Disease Prevention Project. January 6, 7, 8.

DISEASES OF VEGETABLE CROPS IN STORAGE

POTATO STORAGE DISEASES IN MASSACHUSETTS: Twenty-eight bins in 14 storages were inspected in Hampshire and Franklin Counties. Twenty-three bins contained potatoes produced locally in Massachusetts; 5 were Maine-grown potatoes shipped in for storage.

Massachusetts-grown potatoes -- Ten of the 23 bins contained some late-blight (Phytophthora infestans) rotted tubers; only a trace except in 1 bin with 1% affected tubers.

Rhizoctonia (Rhizoctonia solani) was found in 10 of the 23 bins. Affected tubers ranged from a trace to 50% with an average of 12.8% in the 10 bins.

Bacterial ring rot (Corynebacterium sepedonicum) was found in 3 of the 23 bins; about 2% in 1 bin and a trace in the other 2.

Ten of the 23 bins contained scabby (Actinomyces scabies) potatoes. Except for 2 bins, one with about 5% and the other about 1%, there was only

a trace.

Net necrosis (leaf-roll virus) was found in 4 of the 23 bins. Two bins of Green Mountain had 6% and 1% respectively, and 2 bins of Katahdin each had a trace.

Thirteen bins contained potatoes with stem-end browning (cause unknown). Affected tubers ranged from a trace to 75% with an average of 7.5% for the 13 bins. The bin with 75% stem-end browning contained Cobbler potatoes. A bin of Spaulding was found with 10%.

Four bins, all of Katahdin, showed field frost injury; 2 bins contained a trace, 1 about 2%, and another about 5%.

Eleven of the 23 bins were affected by hollow heart (non-parasitic) to some extent. One bin of Cobblers contained about 25% hollow potatoes, according to the grower, and another of Green Mountain about 5%.

Five bins of Katahdin showed sun burn (non-parasitic). Counts were a trace, 15%, 20%, 20%, and 30%, affected tubers.

Maine-produced potatoes -- The 5 lots of Maine-produced potatoes were shipped at digging time and stored in Hawley, Hatfield, and Northampton, Massachusetts. Four of the lots were table stock; one was certified Green Mountain seed and was apparently clean except for about 6% stem-end browning.

The Hawley storage was largest and contained probably 10,000 bushels of Katahdin shipped as bulk field-run potatoes and now keeping very poorly. It seemed likely that about 25% of the tubers would be lost. Observations on this lot showed 25% of sun burn, 20% of field frost injury, 13% of late blight, 1% of bacterial ring rot, a trace of stem-end browning, and some hollow heart.

The storage at Northampton contained 3 smaller lots of Katahdin, Cobbler, and Russet potatoes, that had been graded in Maine and shipped in bags. The Katahdins showed 25% sun burn, 5% field frost, and traces of late blight, hollow heart, scab, and stem-end browning; the Cobblers, 25% late blight and traces of field frost, scab, and stem-end browning; the Russets, 10% net necrosis, and traces of field frost, late blight, hollow heart, scab, and stem-end browning. -- Robert C. Cassell, Emergency Plant Disease Prevention Project. January 2-8

ONION STORAGE DISEASES IN MASSACHUSETTS: In the usually large onion-producing area of the Connecticut River Valley only one storage of any size was found, in Hatfield, and even this storage contained only a few hundred bushels. The onions had been stored in individual boxes and were keeping very well. At the time of observation they were being graded, packed, and sold. The storage loss appeared to be about 3 or 4% at the most, diseases responsible including 2% of Fusarium bulb rot (Fusarium sp.), neck rot (Botrytis allii) 0.5%, bacterial bulb rot (Pseudomonas alliicola) 0.5%, and traces of wound parasites such as Penicillium sp. and Botrytis sp. -- Robert C. Cassell, Emergency Plant Disease Prevention Project. January 2-8.

STORAGE DISEASES OF ONION IN IDAHO: In a large onion storage plant at Wendell, November 27, a considerable amount of Botrytis rot [? B. allii, species not designated] was noted, also a trace of Sclerotinia [sclerotiorum], and considerable damage caused by an unidentified disease in

which the layers of skin rot off near the base of the bulb and present a scaly appearance. Botrytis rot appears to be rather prevalent and an important storage disease.

In onion storages near Twin Falls, November 29, the discolored, loose scale condition of the bulbs was causing considerable damage. At Nampa, December 1, a very extensive development of Botrytis neck rot was noted and the discolored loose scale condition was observed also. A slight amount of neck rot was noted at Parma, December 3.

On January 14 onion storages were examined at Twin Falls and Curry. Botrytis rot was causing appreciable loss in Red Weathersfield and about 10% loss in one lot of white onions. In one storage plant holding about 30 cars of onions, all of the bulbs were frozen solid. -- Earle C. Blodgett, Emergency Plant Disease Prevention Project.

STORAGE ROTS OF SQUASH IN CALIFORNIA: A considerable loss of banana squash in storage was observed near Davis. The principal organisms found associated with this trouble were Rhizopus and Botrytis. -- H. L. Barnett and E. W. Bodine, Emergency Plant Disease Prevention Project. Week ending December 4.

NEMATODE SURVEY IN FLORIDA

A. L. Taylor

During the period January 3 to 8 the work in the vicinity of Bradenton, Florida, was completed.

On a 10-acre truck farm in the vicinity of Tallevast, carrots and other vegetables were found to be only very lightly infected with the rootknot nematode, Heterodera marioni. The grower said that he had had considerable trouble with this pest in the past and that he makes a regular practice of using clean-cultivated velvet beans as a summer cover crop.

On a 15-acre tomato field west of Bradenton, only localized rootknot infection was found, probably less than 5% of the plants in the field being infected. The soil was sandy and well drained. No summer cover crop except weeds is used. The principal weed species is Solanum nigrum. On the same farm, no rootknot was found on squash.

On a one-acre planting of tomatoes east of Tallevast, over 95% of the plants were found to have a heavy rootknot infection. According to the grower, these plants were clean when set in the well drained, sandy soil. Because of cold damage, no estimate of rootknot damage was made.

On the same farm, a 600 sq. yd. celery seed bed had a very heavy rootknot infection with over 75% of the seedlings killed. This was the first crop since the soil had been cleared of its native vegetation, principally palmetto. However, the seedbed was separated from cultivated soil only by a ditch and might easily have become infested by drainage.

Also on the same farm, a seedbed was heavily infested with rootknot last year. During the past summer, it received a heavy application of cyanamide - perhaps 3000 to 4000 lbs. per acre. Afterward, it was kept flooded for a month. No rootknot was found on tomatoes growing in this area.

In a small nursery near Tallevast, potted gardenias in contact with the

soil of a ground bed were found to be heavily infected with rootknot.

Cayenne peppers in a 5-acre field east of Tallevast had a 20% rootknot infection and apparent damage from this cause of about 10%.

On a one-acre planting of tomatoes east of Palmetto, 75% of the plants had a moderate to heavy rootknot infection. As the plants had been seriously damaged by frost, no estimate of damage was made.

Two acres of lettuce on Manatee fine sandy clay had only a trace of rootknot with no damage.

Four acres of tomatoes on Snead's Island had a 75% medium to heavy rootknot infection with some apparent damage due to this cause. On the same farm, a 5-acre pepper field was examined in which the plants in an area of about 1/4 acre were stunted. Although a considerable amount of rootknot was found in this area, it did not appear to be the principal cause of the damage. Soil samples taken from around roots of stunted plants contained numerous specimens of Dolichodorus, Mononchus, and Dorylaimus.

No trouble with rootknot or wilt [Fusarium] was found on a 5-acre planting of Pan America tomatoes. The farmer uses Crotalaria as a cover crop and the soil is frequently flooded during the rainy season. This was the only farm where a good yield of fruit on this variety of tomato was reported. Most growers find it to be a poor producer in this region in the fall, but say that it does better in the spring.

Three acres of a 5-acre tomato field on Snead's Island were found to have been abandoned because of a heavy infection of rootknot and Fusarium wilt.

Gladiolus bulbs with Fusarium rot were found to contain numerous nematodes of the genera Diplogaster, Cephalobus, and Aphelenchoides.

Papaya roots from plants on the grounds of the Experiment Station at Bradenton had very large galls caused by rootknot. Apparently this species reacts more violently to infection than most plants.

In the muck-soil celery area east of Sarasota, only a small amount of rootknot damage was found in the field, certainly less than 1%.

In this same section, 2 celery seedbeds on sandy soil were examined. In each, a large proportion of the plants on the parts of the bed planted in July were infected with rootknot. The loss of plants from this cause was about 25%. Also in both cases, only a trace of rootknot was found on beds planted late, in October. Both sites had been used for celery seedbeds for several years. On one, no cover crop is used in the summer, but an attempt is made to keep it clean-cultivated. Corn is used as a cover crop on the other seedbed. The grower reported that he had considerable trouble on a 2-acre section of the 12 acres used for seedbeds in the past, but believed that he had controlled it by flooding for about 60 days during 2 successive summers. In this bed, numerous yellowish plants with small brownish lesions were found. No nematodes were found in such roots, but the soil around them contained numerous nematodes of the genus Cephalobus, and a few specimens of Aphelenchoides, Dorylaimus, and Acrobeles.

Summary and Discussion of Observations in the West Coast Area. -- While it cannot be maintained that an exhaustive examination of this region has been made, it is felt that the observations recorded in this and the 2 preceding reports are a fair sample of conditions in this vicinity at this time. The fact should be kept in mind that the observations were made following a summer of unusually heavy rainfall during which much of the

poorly drained land was under water or watersoaked a large portion of the time.

Rootknot is undoubtedly the principal nematode disease of this region. It was found on all soil types and in all locations where a thorough search was made. But severe rootknot was less common than might be expected in a warm region where susceptible crops are grown year after year. This is not to say that it is now rare, or that it has been rare in the past. Every farmer was able to tell of crops ruined in the past, or to point out heavily infested areas on his farm, but the distribution was definitely not so uniform as could be expected. Actual damage was greatest on tomatoes, though here the situation was often so complicated by Fusarium and bacterial wilts and by cold damage, that no estimate could be made. On peppers, a noticeable amount of damage was found in some fields. Squash were surprisingly free of infection. Eggplant was often found infected, but the damage due to "soreshin" was generally so severe as to mask damage by rootknot entirely. Celery, which is grown on muck soil, was not damaged greatly in the field, but severe rootknot is often a considerable problem in the seedbed, especially on the earlier plantings. It undoubtedly ruins a large proportion of the plants each year. Gladiolus are often infected, but apparently not damaged greatly, or if they are damaged, the fact could not be ascertained because of the prevalence of Fusarium rot. Cabbage, broccoli, cauliflower, and lettuce are remarkably free from rootknot and were not found or reported to be damaged.

To direct damage due to rootknot, must be added indirect losses caused by the growers' fear of this pest and their ignorance of its true nature. In many instances, growers told of adopting some compromise with what they considered the most profitable course because of fear of rootknot. The fact that a field has been infested or is infested is considered in fixing the rental value.

Control measures that appear to be worthwhile to the farmers include the use of cover crops of Crotalaria, velvet beans, or native weeds, and flooding. Observations indicate that none of these measures are uniformly effective. Crotalaria seems to be best, but it is never used in the most effective way - i.e., planted in rows and kept free of weeds. The usual procedure is to broadcast it. Several such plantings were examined and found to be full of weeds. In one instance, clean-cultivated velvet beans apparently gave good results, but no other farmers were found using this method. Native weeds contain several species highly susceptible to rootknot. Though the evidence is not conclusive, it seems probable that a considerable amount of control is obtained by flooding, either intentional by the use of artesian water, or unintentional, through rainwater. In celery seedbeds, there seems to be a definite correlation between time of planting and rootknot infection, though our present knowledge of the temperature relationships of the nematode do not provide a ready explanation on this basis.

There seems to be no correlation between soil type and rootknot that can be traced to the soil texture itself. Farmers report that the damage is greatest on sandy spots in the field and apparently have little trouble on muck or sandy clay, but this could easily be correlated with drainage. Within the last few years, flooding of muck soils in the summer to control pink rot [Sclerotinia] of celery has been widely practiced. Sandy clay is usually poorly drained, while the sandy spots where rootknot is reported

to be worst are the highest spots in the field and well drained.

How much of the absence of rootknot might be due to the host preference of the local strains of nematodes could not be determined.

The relationship of Fusarium wilt of tomatoes to nematodes is not clear, but the fact that the 2 together are very deadly to tomatoes cannot be doubted.

In summary, it can be said that nematodes, directly and indirectly, are responsible for a very appreciable loss to the growers of this section each year.

Recommendations - - Since the basic difficulty is this section, so far as nematodes are concerned, is lack of information, collection and dissemination of information on the following points should prove to be highly profitable:

1. Data as to the susceptibility of the various crops grown in this region and their liability to damage under local growing conditions.
2. Dissemination of information now available on nematodes and of further information as it becomes available. The purpose is to prevent the grower from wasting money and time on unnecessary or unsound practice.
3. Re-examine all of the control measures now known, especially those applicable on a large scale, keeping constantly in mind the local conditions, growing seasons and available machinery, labor, and water.
4. Experiments on flooding and watersoaking of land on as large a scale as possible.
5. Cross inoculation experiments with all the local cash and cover crops and the principal weeds.
6. Determine the temperature relationships of the local strains of nematodes. Collect soil temperature records until the seasonal variations under average conditions are well understood.
7. Determine the exact relationship of Fusarium wilt of tomatoes to rootknot, both in respect to infection and damage.
8. Investigate the possible relationship of rootknot and other nematodes to Fusarium rot of gladiolus.
9. Conduct systematic trials of such chemicals as appear to have promise of use in seedbeds or fields for control of nematodes.

EMERGENCY PLANT DISEASE PREVENTION PROJECT

VEGETABLE DISEASES IN WINTER TRUCK CROP AREAS

VEGETABLE DISEASES IN NORTHERN FLORIDA: This report is based mainly on a trip through the vegetable growing areas at Sanford and Winter Garden and points in the vicinity from November 29 to December 5, with supplementary notes on brief trips around Gainesville since then.

Sanford Area -- An extensive acreage of various vegetable plantings was examined at Sanford, Seminole County, but little in the way of diseases was seen, as many of the plantings were still young and less subject to diseases than in the spring when warmer weather prevails. Plantings in general were from 2 to 3 weeks later than usual as a result of the excessive rains occurring early in the fall, but were developing nicely. Celery is the main crop in this section, with cabbage as the second most important crop, followed by escarole and lettuce. Only small plantings of other miscellaneous crops occur. No diseases were observed on celery as the plantings were still young and are sprayed at frequent intervals.

Black rot (Xanthomonas campestris) was found to be serious in one 5-acre planting. This disease had attacked large numbers of plants while still fairly small and was causing extensive wilting and dying of other plants large enough to begin forming heads. It was estimated that this disease had already caused a 30% loss of plants and, judging by the rapidity with which it was spreading, it appears doubtful if the grower will harvest more than a few crates of cauliflower from this field. Other small plantings of cauliflower, totaling about 10 acres, appeared free from disease and in fine condition.

Escarole usually suffers little from diseases and then chiefly from leaf spot (Alternaria cichorii). Where the disease develops heavier trimming of the heads is necessary in order to eliminate the unsightly appearance on the outer leaves. In the numerous fields leaf spot was observed in a local area in one large field that was being cut.

Downy mildew (Peronospora parasitica) has proved troublesome in cabbage seedbeds in the Sanford section, as it has in all other areas visited where cabbage plants are raised. The successful production of plants calls for seed disinfection and timely and thorough spraying or dusting of the seedlings. In the Sanford section, at least, growers do not appear to be getting as good a control of this disease as is desired, owing to their tendency to use knapsack sprayers which develop too little pressure to get the under sides of the cotyledons and young leaves well covered with the fungicide.

Only small plantings of snap beans were seen that had about reached the end of their season. Plantingsexamined, totaling 10 acres, appeared free from diseases.

Plantings of peppers appeared to be very few and small in extent. All were characterized by small, rather stunted plants about half normal size in general and frequently much smaller, owing to the damage occasioned by excessively wet weather in late summer and early fall. Leaf spot (Cercospora capsici) was of widespread occurrence in one field of about 2 acres, where it caused considerable defoliation. This disease was especially inclined to be troublesome in those plantings where the new blight-resistant Worldbeater variety was not used. Some fruit loss occurred from miscellaneous decays, particularly where the peppers rested on the ground.

Winter Garden and Vicinity -- The vegetable plantings in the Winter Garden section occurred in widely scattered areas around Winter Garden, Tildenville, Ocoee, and Minorville in Orange County. All plantings were on land provided with subirrigation and drainage by underground tile installation, as in the Sanford area. The total acreage of crops examined at these points comprised 196 acres of peppers, 104 of cabbage (mostly green but some red), 78 acres of escarole, 26 of eggplants, 20 of cucumbers and 10 of snap beans.

In most cases plants in the extensive plantings of peppers in this section averaged only about half normal size and in some cases were decidedly small and spindly in appearance on account of the excessively wet soil conditions occurring earlier. The plants were quite productive, however.

In all plantings visited Kilgore's Worldbeater, a recently introduced blight resistant variety, was used exclusively. Previously the Ruby Giant variety was largely grown, but it proved too susceptible to Cercospora leaf spot (Cercospora capsici) especially in wet weather. Kilgore's Worldbeater appears to have a high degree of resistance to leaf spot. This disease was found in only 2 fields, one of which had been sprayed but once after the plants were set out, and even then was causing little leaf loss. Miscellaneous fruit rots occurred in all fields visited, especially where the fruit rested on the ground, but in no case were they serious. The only other disease noted in any of the pepper fields visited was the death of occasional plants in one 16-acre field at Winter Garden, apparently due to Rhizoctonia solani.

Most of the cabbage plantings visited appeared free from diseases and in excellent condition. These plantings were of various ages and none was ready for cutting. In a 15-acre planting at Minorville 7 acres showed a poor stand, which was said to have been due to the poor quality of plants bought and to the dryness of the ground where they were set. A poor stand in part of one field in the Black Lake section south of Tildenville, where some resetting of plants was said to have been done, showed distinct evidence of Rhizoctonia root rot (R. solani). Affected plants remained small and stunted, and wilted and died following the decay of the roots. In another planting at Minorville some wilting and dying of plants from apparently the same cause occurred earlier in a portion of one field but no recent cases were seen.

A more serious instance of this disease was found in a much older 5-acre planting at Winter Garden, where most of the plants had attained a good size. In this case the young leaves turned bluish and developed a hard, stunted appearance; the lower leaves became yellow and died and eventually the entire plant wilted and died. The disease occurred scattered throughout the field. A large number of the more recently dying plants were pulled up for examination but in all cases the stem tissues below ground were extensively rotted, often so badly that the plants broke off. This appeared to be another instance of Rhizoctonia root rot, though cultures made from plants sent in yielded merely various bacteria. The plant loss from this trouble was estimated to be 5%. The grower stated that other plants from the same seedbed set in another field showed little or none of this trouble.

An 8-acre eggplant planting at Winter Garden, from which the first picking had been made, showed occasional dying of plants from Phomopsis blight

(Phomopsis vexans), ranging from sporadic plants to several consecutive ones in some rows. However, the plant loss in this field was not estimated to exceed 1%. In a 4-acre planting by the same operator at another point there was a 15% loss of fairly young plants, apparently from Phomopsis blight, and cabbage plants had been set in the vacant places; but little additional evidence of this disease was seen on the older plants, the first picking from which was being made at the time of my visit. The field foreman stated that these eggplants were on a poor piece of land that had been farmed until about worn out and also was badly infested with nematodes. A planting of 1-acre of eggplants on a small farm operation at Ocoee showed about 25% of plants from Phomopsis vexans. In a planting of about 13 acres at Minorville, where eggplants were tried for the first time, the yield was said to be poor. Phomopsis blight was prevalent but extremely variable in its occurrence. On the half of the planting on the better land the plant loss was estimated to be 5%, but on the other half, which was on poor sandy flatwoods lands, there was fully 25% plant loss and considerable fruit loss as well.

Various plantings of escarole examined appeared to be free from diseases with the exception of a 2-acre planting at Minorville, which showed a rather severe general infection of practically all the plants by Alternaria leaf spot (Alternaria cichorii).

A 20-acre planting of cucumbers examined at Winter Garden was characterized by a rather poor stand, particularly in places where the soil was lighter than usual. The plants showed considerable nematode infection which no doubt will stunt them more or less, and also aphid infestation in places. Considerable damage to the older leaves had resulted from a period of cold wind occurring earlier but the plants had developed considerable new growth since then and have become old enough to begin setting fruit.

Miscellaneous Observations -- A 30-acre planting of tomatoes on prairie land west of Rockledge (Brevard County) was pronounced by experienced tomato men who visited it to be the finest that they had seen in the State, The success of this planting was jeopardized by heavy rainfall early in the season but an additional pump was secured and installed in time to save all but about an acre in a depressed area where the drainage ditches were not so effective. The plants on the west half of the field averaged much better than those on the east half. There was some infection of leaves of plants by Alternaria solani, which was rather bad on a few plants in one local area and may cause serious damage if weather conditions are right. However, the plants have been given another spraying and have an unusually fine crop of fruit set which is about ready for the first picking.

A 4-acre planting of eggplants was found near Rochelle, Alachua County, on the occasion of a local trip, December 11. This proved unique in having escaped damage from frosts that occurred earlier, apparently by reason of its location on the southeast side of Newman's Lake. The planting was on a worn-out piece of farm land. It showed a widely varying loss from the blight caused by Phomopsis vexans, ranging from slight on one side to severe on the other and averaging fully 40%. On the worst-affected side of the field all plants in lengthy portions of rows had died in some cases. There was also considerable loss from fruit rot in this field. Two small plantings at Windsor, 3 miles north, showed comparatively little loss from Phomopsis blight but both were seriously killed back by frost. -- Arthur S. Rhoads, Emergency Plant Disease Prevention Project.

VEGETABLE DISEASES IN THE TEXAS WINTER GARDEN REGION: Beet (225 acres surveyed). Leaf spot (Cercospora beticola) was observed near Batesville (Zavala County), Laredo (Webb County), and San Antonio (Bexas County). Loss was negligible except in a planting near Batesville where considerable defoliation of the lower leaves was being caused.

Carrot (953 acres surveyed). Aster yellows (virus) remains widespread and prevalent in the Winter Garden region. From 1 to 62% infection was observed in plantings surveyed during this period. The varieties Chantenay and Imperator are highly susceptible to infection by the virus and show very little, if any, tolerance.

Infection observed in the different counties is summarized in the following tabulation:

County	Acres observed	Average infection	Range of infection
		%	%
Bexar: present, no new fields observed			
Dimmit	443	28	1 - 62
Maverick	6	14	1 - 27
Webb	260	21	1 - 50
Zavala	244	23	1 - 27

In spite of the rainy cold weather of the past month the insect vector is still prevalent in carrot and lettuce plantings, according to Dr. W. H. Ewart, Entomologist, Substation 19, Texas Agricultural Experiment Station.

In order to determine the approximate loss to carrot growers in this region, Dr. S. S. Ivanoff, Dr. Ewart, and the writer harvested carrots on 3 different dates. The carrots were graded according to market standards. The following summary is suggestive of the loss being sustained by the growers:

945 carrots harvested:
- 137 - healthy culls
- 494 - infected with aster yellows virus
- 32 - virus-infected plants marketable as bunch carrots.

According to information from various growers and packers the above data are comparable to the average loss sustained in fields harvested so far.

Rootknot (Heterodera marioni) was observed in a 50-acre planting near Laredo, to the extent of 1%.

Cruciferous Plants. Broccoli, brussels sprouts, cabbage, and cauliflower were relatively free from diseases in most of the 375 acres surveyed. Examples of black rot, leaf spot (Alternaria brassicae) [? = A. circinans], and dry or watery soft rot (Sclerotinia sclerotiorum) were observed, but very little loss could be attributed to these diseases.

Light frost injury was apparent on most plants.

In a 50-acre cauliflower planting near Eagle Pass (Maverick County), a loss of approximately 30% was due to Alternaria blackening of the heads (presumably A. brassicae) [? A. circinans].

Turnip plantings totaling 125 acres were examined. Powdery mildew (Erysiphe polygoni) appears to be increasing in the Winter Garden area, but the loss, in each instance observed, is negligible.

Endive (50 acres surveyed). Less than 1% of aster yellows (virus) was observed in plantings near Winter Haven (Dimmit County).

Lettuce (114 acres surveyed). Aster yellows-infected plants were observed in all lettuce plantings surveyed, the degree of infection varying with the age of the plants. Lettuce approximately 1-1/2 months old showed 7% infection; mature lettuce from 30 to 52%. The most severe infection, 52%, was observed north of Laredo on mature lettuce.

Onion (225 acres surveyed). Pink root (Phoma terrestris) was observed in "seed beds" in Dimmit, LaSalle, and Zavala Counties. The most severe infection was observed in a planting near Cotulla, LaSalle County, where nearly 100% of the young plants were affected.

Spinach (2334 acres surveyed). White rust (Albugo occidentalis) was locally prevalent in plantings in Zavala and Maverick Counties. Infection of 100% was causing almost total loss in a 50-acre planting near Batesville, Zavala County. Flat leaf spinach as well as Savoy spinach was affected. The disease was causing considerable losses in several plantings between El Indio and Eagle Pass (Maverick County).

Downy mildew (Peronospora effusa) was observed in nearly all fields surveyed. In many instances the disease delayed harvest for 2 or 3 weeks.

Leaf spot (Heterosporium variabile) was localized in Dimmit, Maverick, and Zavala Counties. Moderate to severe infections were observed in sections of fields near Crystal City and Eagle Pass.

Aster yellows was the most widespread and prevalent virus disease observed on spinach, being apparent in all mature spinach surveyed during this period. It was causing nearly 60% loss in a 75-acre planting near El Indio, Maverick County.

Curly top (virus) was causing 1% loss in 2 large plantings in Maverick County. Spinach plants infected with curly top have been observed in Dimmit, Frio, Maverick, Webb, and Zavala Counties.

Occasional plants affected by mosaic (cucumber virus) were observed in Maverick, Webb, and Zavala Counties. In a planting of flat leaf spinach near Batesville at least 5% of the plants were infected. -- Howard W. Larsh, Emergency Plant Disease Prevention Project. December 20 - January 7.

VEGETABLE DISEASES OBSERVED IN CENTRAL CALIFORNIA: During most of the week ending January 8, heavy rains prevented field work. A one-day survey was made along the coast in San Mateo County, particularly in the vicinity of Half Moon Bay. In this area, the principal crops at this time of the year are artichokes, brussels sprouts, and cabbage.

Artichokes were exceptionally free from disease. Only a very slight amount of leaf spot (Ramularia cynarae) was found.

A very heavy infection, probably 100%, of rust (Uromyces betae) was observed in one garden beet field of several acres. Other fields only a short distance away showed very light infection.

Brussels Sprouts were moderately to heavily attacked by ring spot (Mycosphaerella brassicicola) throughout the entire area surveyed. However, very little was found on the sprouts themselves and the actual loss due to this disease was probably slight. A few of the older plants were producing seed and a light infection was seen on some of the pods. Slight to moderate amounts of black ring (virus) occurred throughout the area; and scattered light infections of mosaic (virus) were observed. Powdery mildew (Erysiphe polygoni) was present but doing no damage.

Ring spot was doing little or no damage in the cabbage fields observed although it was commonly found. Both cottony rot (Sclerotinia sclerotiorum) and gray mold rot (Botrytis cinerea) were present in most fields in small amounts. Only traces of powdery mildew and of downy mildew (Peronospora parasitica) were found.

Black ring was the most severe disease of cabbage in this area, particularly in the immediate vicinity of Half Moon Bay. As much as 40% was estimated in some fields. Severity of infection of individual plants varied greatly. Plants most severely affected are not being harvested. -- Horace L. Barnett, Emergency Plant Disease Prevention Project

DISEASES OF VEGETABLE CROPS IN SOUTHERN CALIFORNIA: November 29, in the vicinity of Pomona, Los Angeles County, with J. T. Middleton -- Many fields of Broccoli and Cauliflower were observed that contained plants showing mosaic symptoms. Counts in 3 plantings indicated that 3% of the plants were affected. The fields were heavily infested with aphids and no doubt many additional plants not yet showing the symptoms were infected. Downy mildew also was found on cauliflower but affected only an occasional plant. A non-parasitic disturbance termed "blind head" by the growers, in which the terminal bud fails to develop after forming the outer leaves, affects a small percentage of the plants.

December 9, 10, 11, in San Luis Obispo and Santa Barbara Counties with J. T. Middleton, K. F. Baker, H. L. Barnett, and E. W. Bodine -- In a large artichoke planting near Guadalupe 10% of the plants were severely damaged by Ramularia leaf spot. Practically all of the leaves were heavily spotted and flower stalks and heads also were attacked. All of the plants showed at least the lowest leaves heavily spotted.

Table Beets in a large planting near Arroyo Grande showed traces of curly top (virus) and rust. Chard in a small planting near Lompoc showed 1 to 2% of the plants affected by downy mildew (Peronospora schachtii). An old planting of chard nearby was severely affected by rust.

Cauliflower plantings in the Arroyo Grande area were young and very little mosaic was found, although mosaic symptoms were seen on cruciferous weeds at the margins of the fields, and aphids were present. Near Lompoc, downy mildew was seen in an old planting where the fungus was systemic in the crowns and curds of many of the plants. Old, inactive white rust (Albugo candida) lesions were found on the seed stalks, but no active lesions were seen. Near Guadalupe mosaic was abundant in the older plantings, and an occasional plant affected with aster yellows (virus) was found.

Rotting of the outer leaves and invasion of the stems near the ground by Botrytis cinerea was observed in a small cabbage planting near Lompoc.

No disease was found in a large planting in the same valley. In a large planting of Broccoli near Guadalupe 100% of the plants were badly defoliated as a result of leaf spotting (Alternaria brassicae)[? A. circinans]. An occasional plant was affected by aster yellows.

A small Tomato planting near Arroyo Grande was about 30% affected by curly top. Another planting of staked tomatoes in the same area was severely affected by double-virus streak.

A large planting of brussels sprouts near Lompoc appeared to be free from disease although aphids were present. An old planting of snap beans near Arroyo Grande was examined without finding any disease. Leeks in a large planting near Lompoc, and lettuce plantings near Arroyo Grande, were free from disease.

December 14, in Los Angeles County with K. F. Baker. -- In a 1-acre Cauliflower planting in the Compton area an occasional plant was affected by mosaic; while 15% of the plants in a neighboring field showed late-infection mosaic. A single plant in the latter field showed symptoms of black ring. Both plantings contained numerous plants bearing a few downy mildew spots on the lower leaves. Most of the plants in a 1-acre Cabbage planting in this area showed downy mildew spots on the lower leaves.

A 10-acre field of tall Peas in the Venice area showed from 5 to 10% of the plants affected by mosaic, less than 1% of which was associated with Pea virus 1. Leaf spots (Ascochyta spp., and Cladosporium pisicola) were present on the lowest leaves of a large percentage of the plants. In a second, 1-acre, planting of dwarf peas, 1% of the plants were affected by mosaic and a trace of leaf spot (Ascochyta spp.) was found. The stand in this field was very poor. A third planting of half an acre seemed free from disease, but an area comprising nearly half of the field was bare of plants.

A 5-acre planting of Summer Squash in the Venice area showed an occasional plant affected by mosaic.

December 15, 16, 17, in Imperial County with Dr. Middleton -- A large planting of Carrots in Temecula Valley showed a few leaf spots (Cercospora carotae) on most of the plants.

Yellow Bermuda Onions in a 50-acre planting were free from disease, but showed some injury from "Sinox" weed-control spray. A number of other onion plantings were visited briefly without finding any disease.

One Pea field was visited in the Niland area. Specimens were obtained showing yellowing and dwarfing of the plants above ground, and numerous lesions due to Rhizoctonia solani on the stems below ground.

January 6, 7, 8, in San Diego County with Dr. Middleton -- A small field of snap Beans in the Chula Vista area was nearly 100% affected by powdery mildew (Erysiphe polygoni). An occasional plant was attacked by Rhizoctonia root rot. A trace of rust (Uromyces phaseoli var. typica) was observed in a 1-acre planting of pole beans.

Beets in a field near Palm City were generally affected by Cercospora leaf spot, and showed a trace of rust.

In an 80-acre Celery planting south of Chula Vista 4% of the plants were

affected by pink rot (Sclerotinia sclerotiorum), which was just beginning to appear following heavy rains. About 0.3% of the plants in the same field were affected by Fusarium yellows (Fusarium orthoceras var. apii). This is much less yellows than had occurred in this field in previous years, and the reduction is associated with later planting of green instead of golden varieties. The older leaves of occasional plants bore a few late blight (Septoria apii-graveolentis) lesions. Another 40-acre planting in this area showed traces of pink rot, Fusarium yellows, and late blight. A planting in the Palm City area was 100% affected by late blight, with 50% of the foliage destroyed. A 10-acre field near Vista was free from disease although late blight was severe earlier.

In a Broccoli planting of 1-1/2 acres near Palm City 50% of the plants were heavily spotted with downy mildew, and a single plant was found to be affected by mosaic. Ten acres of Cauliflower near Palm City showed about 10% of the plants affected with mosaic; downy mildew and aster yellows were also present in small amounts. In another 1/2-acre cauliflower planting mosaic was present. An old Mustard planting near Palm City was 100% affected by powdery mildew.

A large Lettuce planting near Palm City showed a trace of gray mold rot and a trace of mosaic.

In a 2-acre field of Peas south of Chula Vista traces of an undetermined root rot were observed, about 2% of the plants showed some leaf spot (Ascochyta), 2% were affected by Fusarium wilt (Fusarium orthoceras var. pisi), and scab (Cladosporium pisicola) was generally present, deforming the youngest pods.

In a small planting of old Pepper plants near San Juan Capistrano approximately 30% of the plants were affected with mosaic. From 3 to 5% of the plants in a second planting near Palm City were killed by root rot (Phytophthora capsici).

Spinach downy mildew was found on a few plants in a small field in the vicinity of Palm City.

Three Tomato plantings near Palm City and 2 near Vista were nearly defoliated by early blight. Traces of spotted wilt (virus) and Verticillium wilt (Verticillium albo-atrum) were found near Palm City. (For late blight see under late blight above.)

January 12, 13, 14, in Imperial County with J. T. Middleton, E. W. Bodine, W. C. Snyder, H. N. Hansen, and C. E. Scott -- Eight plantings of Peas were visited in the Imperial and Coachella Valleys. Practically no above-ground diseases were observed, the only exception being powdery mildew (Erysiphe polygoni), which was found in an old field in the Niland area. Root rots of various origins were the most common diseases observed, being found in 6 out of the 8 plantings examined. Fusarium wilt (F. orthoceras var. pisi) seemed to predominate, but evidence was obtained of the presence of other root diseases (Rhizoctonia solani, Ascochyta spp., and Pythium sp.). In poorly drained soils the root diseases appeared to be associated with alkali damage. Stands in most fields were poor, indicating that damping-off fungi may have been active earlier. Low temperature effects on pods and leaves were common throughout the area.

In Tomato fields, frost damage to the vines prevented detection of some of the virus diseases which, no doubt, were present. Curly top occurred

in at least low percentage of the plants. Spots resembling the early stages of fruit pox (undetermined) were observed on many green fruits of all sizes both in the field and in the packing sheds. Fruits bearing these spots that were waxed and held in storage for several days exhibited dark pits resembling the later stages of fruit pox. Similar fruits treated in the same manner except that they were not waxed did not develop the dark pits. Losses approaching 25% were experienced in shipments of green-wrap tomatoes after waxing, because of blemishes developing on the shoulders of the waxed fruit. Unwaxed fruit treated in the same way did not develop these blemishes. -- Seth Barton Locke, Emergency Plant Disease Prevention Project

BRIEF NOTES ON PLANT DISEASES

DISEASES OF CITRUS FRUITS IN THE TEXAS WINTER GARDEN AREA: Anthracnose (Colletotrichum gloeosporioides) was causing moderate to severe defoliation in a small orchard at Catarina, Dimmit County. Grapefruit trees were affected more severely than orange trees in this orchard.

Melanose (Diaporthe citri) was found in some degree in every orchard surveyed. Moderate to severe leaf and fruit infection occurred in orchards near Crystal City (Zavala County), Catarina, and Laredo (Webb County); however, very little economic loss resulted.

Heart rot (Diplodia natalensis) was observed causing considerable loss in a neglected grapefruit orchard near Laredo. Grapefruit trees near Catarina were affected by heart rot or wood rot.

Fruit rot (Alternaria citri) was found occasionally in the Winter Garden area, but very little loss could be attributed to it.

Fruits infected with Penicillium spp. were found in nearly all of the orchards surveyed. -- Howard W. Larsh, Emergency Plant Disease Prevention Project. December 20 - January 7

OBSERVATIONS ON CEREAL CROPS AND WINTER LEGUMES IN CENTRAL TEXAS: During the week ending December 18 a trip was made for the purpose of examining winter small grains and winter legumes. The area surveyed included a portion of Central Texas extending from College Station to Goldthwaite, thence southward to Fredericksburg, Seguin, and Yoakum. Extensive plantings of winter oats and occasional fields of wheat were examined all along the route. No evidence of disease was observed in any of the fields. Some of the plantings showed signs of damage from drought.

The chief winter legumes used as soil-building crops in the area surveyed are field peas (Austrian winter), common vetch, hairy vetch, Hubam clover, and Melilotus indica. No diseases were encountered in any of these crops, except in a field of Austrian winter field peas near Thrall, Williamson County. Powdery mildew (Erysiphe polygoni) was generally distributed in this field, but had not caused serious damage.

During the week temperatures in the area surveyed dropped to 15° F. -- G. M. Watkins, Emergency Plant Disease Prevention Project.

DISEASES OF BARLEY IN THE COASTAL AREA OF CENTRAL CALIFORNIA: During the week ending January 8 a one-day survey was made of plant diseases along the coast in San Mateo County, particularly in the vicinity of Half Moon Bay. Most of the barley fields in this general region were in the seedling stage at this time. A number were examined for the presence of disease.

A heavy infection of powdery mildew (Erysiphe graminis) was found in several fields, especially in the earlier plantings. Considerable yellowing was already apparent and the loss in some places may be severe.

A light infection of leaf rust (Puccinia anomala) was observed in one field.

Scattered infections of net blotch (Helminthosporium teres) were found throughout the area. Apparently only slight damage was being done at present.

Scald (Rhynchosporium secalis) was causing a rather severe seedling blight in one field. Although net blotch was also present, it is thought that most of the damage was caused by scald. Loss in this field may be heavy. -- Horace L. Barnett, Emergency Plant Disease Prevention Project

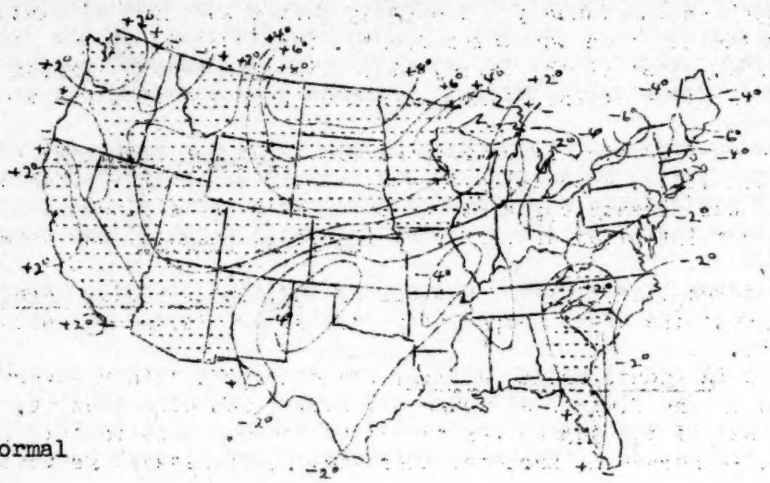
DECEMBER WEATHER

(From U. S. Department of Commerce Weather Bureau Weekly Weather and Crop Bulletin for week ending January 4, 1944).

Map 1 shows that December 1943, was much warmer than normal in the States between the Lake region and Rocky Mountains and also in the eastern Great Basin. Elsewhere east of the Rockies there were small to moderate temperature deficiencies, except that much of the south Atlantic area had somewhat more-than-normal warmth. There were marked contrasts between the northern and southern Great Plains.

However, the most interesting features of December weather were the irregularities and abnormalities of precipitation. Map 2 shows that in the north-central area of relatively warm weather there was either no precipitation at all or only inappreciable amounts, while to the south and southwest, with minus temperature anomalies, heavy falls occurred. It will be noted on maps 1 and 2 that the boundary between the relatively warm and cold weather conforms almost exactly to that delineating the dry and the wet areas.

East of the Mississippi Valley precipitation was generally deficient, except locally in the south Atlantic States. In the Pacific coast area normal conditions were completely reversed. Seattle, Wash., with a normal of 5.60 inches, received 1.27, while San Diego, California, normal 1.87, had 7.60 inches. Seattle had the driest December of record, while the 7.60 inches at San Diego have been exceeded only twice in more than 90 years.



Shaded areas normal or above.

Map 1. - Departure of Mean Temperature from Normal, December 1943

Shaded areas normal or above

Map 2. - Percentage of Normal Precipitation, December 1943

THE YEAR 1943

(From U. S. Department of Commerce Weather Bureau Weekly Weather and Crop Bulletin for week ending January 4, 1944).

Map 3 shows that 1943, in line with a large percentage of the years during the last couple of decades, was warmer than normal in most sections. For the country as a whole, 15 of the last 20 years have had normal or above-normal temperatures. East of the Great Plains the 1943 anomalies were comparatively small, but for the western half of the country the year was decidely warmer than normal. Map 4 shows that the annual precipitation was largely deficient, in contrast to 1942 which had near normal to much above normal practically everywhere.

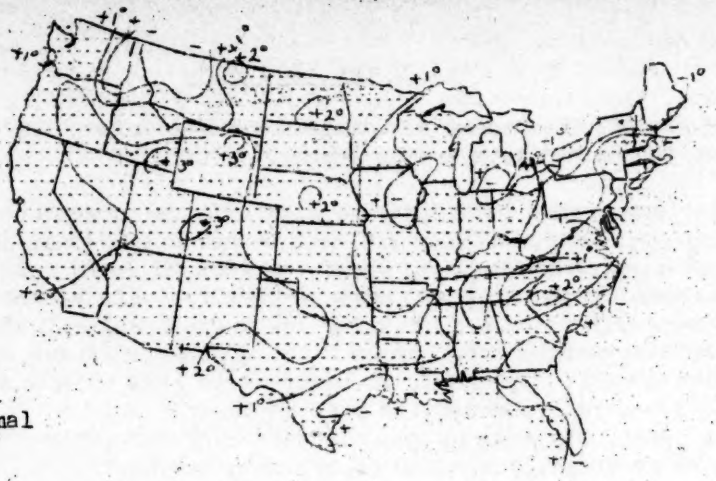
In general, the weather was somewhat less favorable for agriculture than in 1942, principally because of untimely spring frosts, unfavorable wetness during the spring planting season and, later, harmful dryness in certain areas. Dry weather curtailed crop production in some sections, but in most of the principal agricultural States favorable conditions prevailed and the general farm output, while considerably less than for the preceding year, was larger than normal. The less favorable crop weather is shown by the fact that while the combined acreage for 52 crops harvested in 1943 was more than 9 million acres in excess of 1942, total production was 6 percent less.

Notwithstanding rather general warmth, the winter brought some extremely cold weather. The lowest temperature reported was -60° at Island Park Dam, Idaho, on January 18; the lowest in Alaska was -64° at Allakaket on January 31. There were also several periods of unfavorably cold weather in the spring which heavily damaged fruit and early vegetables over a wide south-central and southern belt, extending from the Atlantic Coast to the Great Plains, and unusually small crops of apples, peaches, cherries, apricots, and strawberries survived for harvest.

East of the Mississippi River, in addition to the untimely frost, the spring months brought frequent heavy rains to many sections which saturated and flooded lowlands and seriously hampered farmers in planting corn, haying, and other seasonal work. The corn crop got off to a late start, but with the advent of summer favorable temperatures and much sunshine hastened development and relieved the apprehension of probable failure to mature before the fall frosts. Summer warmth hastened maturity and there was no material frost damage, while the fall season was unusually favorable for harvest; production for the country as a whole was the second largest of record.

The summer was warmer than normal in nearly all sections of the country and most of the principal agricultural states had sufficient moisture to produce good crops, but unfavorable dryness developed in central-eastern sections and much of the South. The highest temperature recorded for the summer was 124° in July, reported from 2 stations in California. The highest in Alaska was 90°, which was only 4° lower than the highest in the sub-tropical island of Puerto Rico.

The outstanding feature of the fall months was widespread dryness, in



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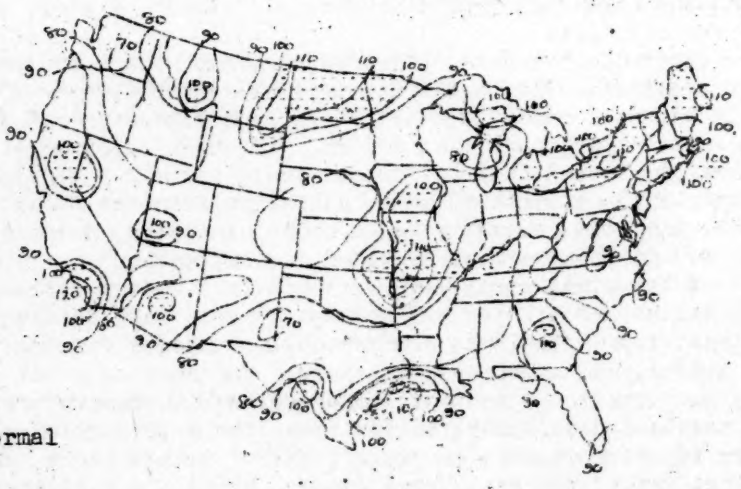
Map 3. - Departure of Mean Temperature from Normal for the year 1943



Shaded areas normal or above

Map 4. - Percentage of Normal Precipitation for the year 1943

marked contrast to the two preceding falls. It was one of the driest falls of record over large areas. While this facilitated the harvesting of crops, the dryness was unfavorable for the seeding and germination of winter grains, especially in the western Winter Wheat Belt and the South.

About the middle of December another severe freeze overspread the South, resulting in more or less damage, heavy in localities, from Texas eastward to Florida and the Carolinas. Florida suffered most with a loss of truck crops, many ready for market, valued at more than 4 million dollars.

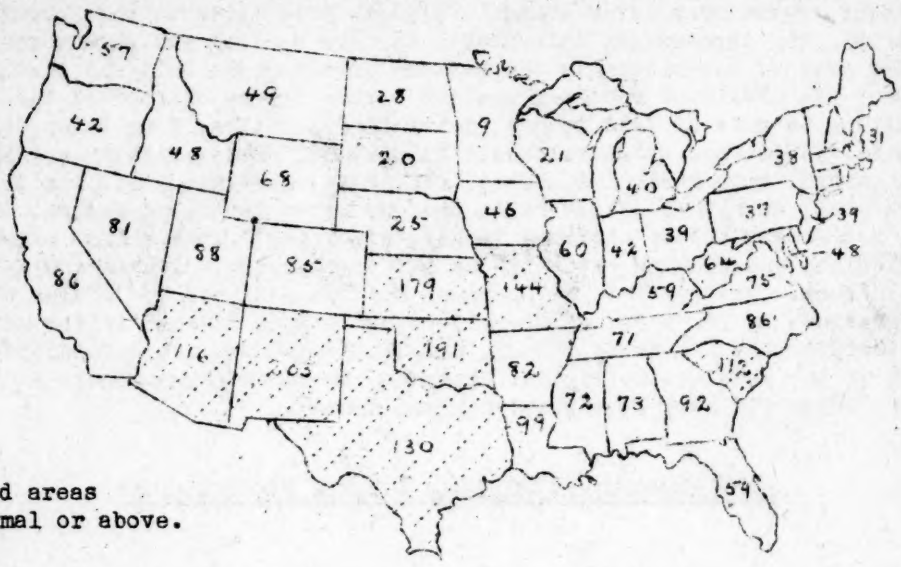
The year, mainly the first-half, brought extensive flood damage. The most noteworthy floods occurred in May, affecting 7 States from Oklahoma to Michigan and causing extensive damage to rich agricultural and industrial areas. In parts of the Arkansas and Osage Rivers the floods were the greatest in 100 years, with near-record stages reached in the middle Mississippi, the Illinois, Wabash, and Maumee Rivers. An outstanding storm of the year was a tropical hurricane in southeastern Texas on July 26-29, which did some 15 million dollars damage.

PRECIPITATION IN DECEMBER AND FOR THE YEAR 1943

(From U. S. Department of Commerce Weather Bureau Weekly Weather and Crop Bulletin for week ending January 11, 1944).

Map 5 shows by States the percentage of normal precipitation for December 1943, the outstanding feature of which is widespread dryness. Most Northern States were extremely dry and only seven for the entire country had as much as normal precipitation. New York, New Jersey, and Pennsylvania had the driest December of record; Michigan, Wisconsin, Minnesota, and North Dakota the driest since 1913, and Ohio since 1925. An interesting feature of this map is some midwest contrasts. While Iowa and Nebraska both had the driest December since 1929, in two adjoining States, Kansas and Missouri, it was one of wettest of record. Such marked contiguous variations in rainfall obviously would be very difficult, if not impossible, for a long-range forecaster to determine if specific areal predictions are to be made.

The year 1943.-- Map 6 shows the percentage of normal for the year 1943. Approximately three-fourths of the States were relatively dry with the country-wide average 91.3 percent of normal. It was the second year with a national deficiency in precipitation since the extremely dry year of 1936; the other dry year was 1939.



Shaded areas normal or above.

Map 5. - Percentage of Normal Precipitation by States, December 1943.

Shaded areas normal or above.

Map. 6 - Percentage of Normal Precipitation by States for the Year 1943.